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Methods of local gene delivery to vascular tissues.

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The development of methods employing the introduction of new genetic material for therapeutic applications in the cardiovascular system is dependent not only on the evolution of molecular vectors, but also 'mechanical vectors' encompassing a variety of mechanisms and approaches for the delivery of vectors or vector-modified cells to anatomical regions of interest. A significant challenge lies in the evolution of mechanical devices capable of highly efficient, localized and homogeneous delivery. Each of these three characteristics, though very desirable, remains generally elusive for several kinetic and physical reasons. Recently developed devices which render possible minimally-invasive peri- or epivascular delivery may provide advances in these aspects of delivery.

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Stimuli-responsive gene delivery vectors.

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One of the major limitations to efficient gene delivery mediated by synthetic non-viral vectors is the presence of various barriers between the site of administration and localization in the cell nucleus. Each of the barriers often demands significantly different properties from the vector. Delivery vectors that can recognize changes in the environment and that are capable of actively responding by altering their properties or behavior are therefore being developed to address the challenge of integrating the sometimes contradictory characteristics necessary for effective gene delivery. This review discusses recent developments in the area of gene delivery vectors capable of responding to various endogenous and exogenous stimuli by changing their properties or behavior.

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